

The Influence of Surgical Approach on Acetabular Cup Migration and Wear in Total Hip Arthroplasty: A Multi-Centre Radiostereometric Analysis Study.

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INTRODUCTION:

Aseptic loosening and implant wear are two common causes of failure in modern total hip arthroplasty (THA) devices. This study sought to elucidate differences in acetabular cup migration and linear wear on a single implant system between three common surgical approaches to the hip.

METHODS:

Eighty six patients requiring primary total hip arthroplasty for osteoarthritis were enrolled at two Canadian centres into two separate studies. All patients received a cementless acetabular cup and highly cross-linked polyethylene component. In the primary study, patients received a standard THA via one of three surgical approaches; posterolateral, direct lateral, direct anterior. In the secondary study, patients received a dual-mobility THA (DM-THA) via any surgical approach. Adjuvant acetabular screw fixation was not used in either study. Participating surgeons performed their preferred surgical approach. Due to cancellation of funding, the enrollment goals of 90 patients in the primary study (30 per approach) and 30 patients in the secondary study, were not fully achieved. To bolster overall patient numbers, the two studies were combined for continuation of follow-up out to the study endpoint. Patients underwent supine RSA imaging at 6 weeks (baseline), 6, 12, and 24 months following surgery. The primary study outcome was acetabular cup subsidence (superior migration) at 24 months. Secondary study outcomes were total translation of the acetabular cup (vector migration) and wear (linear head penetration).

RESULTS:

Study group assignment was as follows: Posterior – 45 patients (36 THA + 9 DM-THA), Lateral – 18 patients (17 THA + 1 DM-THA), Anterior – 23 patients (22 THA + 1 DM-THA).

Across all patients, mean subsidence of the acetabular cup was 0.04mm (SD: 0.25), and 0.07mm (SD: 0.38) at 12 and 24 months respectively, indicating stable fixation. Mean total translation of the acetabular cup was 0.43mm (SD: 0.32), and 0.56mm (SD: 0.43) at the same time points. Mean wear reached 0.31mm (SD: 0.19) at 24 months with an annual rate of 0.04 mm/yr (SD: 0.19) derived from linear regression of each patient's linear head penetration into the cup.

The rate and pattern of acetabular cup subsidence was very similar between surgical approach groups. The anterior approach group demonstrated more total translation (0.80mm, SD 0.47) compared to the posterior group at 24 months (0.46mm, SD 0.38, $p=0.003$) but this may be influenced by disproportional sample sizes. The anterior group also demonstrated higher cumulative wear at 24 months (0.43mm, SD 0.27) compared to the posterior group (0.26, SD 0.13, $p=0.001$). Similarly, disproportionate sample size and greater variance may explain this discrepancy as the annual wear rate, based on linear regression, did not differ significantly ($p=0.63$). Dual-mobility THAs showed very similar subsidence and wear patterns as the standard THAs.

DISCUSSION AND CONCLUSION:

This study sought to compare acetabular cup migration patterns and wear between different surgical approaches to the hip. Despite some statistical differences found in the anterior approach group, our data generally shows that surgical approach does not influence acetabular cup migration or wear within the first two post-operative years.